

REMARKS

Summary of the Office Action

The drawings are objected to under 37 C.F.R. §1.83(a) for not showing all of the claimed subject matter, and under M.P.E.P. §608.02(g) for not being designated by the legend "Prior Art."

The specification is objected to for not referring to FIGs. 1a-4d as "prior art."

Claims 9-15, 17, and 18 stand rejected under 35 U.S.C. 112, second paragraph.

Claims 6-8 and 16 are allowed.

Summary of the Response to the Office Action

Applicants have amended the specification and claims 9-15, 17, and 18. Accordingly, claims 1-18 are pending for further consideration. Applicants also submit a Request for Approval of New Drawings herewith.

Objection to the Drawings

The drawings are objected to under 37 C.F.R. §1.83(a) for not showing every feature of the claims. Specifically, the interleaving insulating layer and contact hole recited in independent claim 1, and the ARC layer recited in dependent claim 18 are allegedly not shown in the drawings. Applicant respectfully submit proposed new drawings provided with a Request for Approval of New Drawings filed concurrently herewith. Applicant respectfully submits that the new drawings do not introduce new matter, and are provided in accordance with the Examiner's suggestions. Accordingly, Applicant respectfully request approval of the proposed new drawings, and withdrawal of the objection.

The Examiner objects to FIGs. 1a-4d under M.P.E.P. § 608.02(g) as not being designated by the legend “Prior Art.” FIGs. 1a-4d are currently designated as “Related Art.”

M.P.E.P. § 608.02(g) makes **no** requirement that drawing figures other than those of the invention must be designated as “Prior Art.” M.P.E.P. § 608.02(g) states that “where needed to understand applicant’s invention, [drawing figures other than those of the invention] may be retained if designated by a legend **such as** “Prior Art” (emphasis added). Applicants submit that by using the phrase “such as,” M.P.E.P. § 608.02(g) provides for the designation “Prior Art” as an exemplary designation but is not limited to “Prior Art.” Applicants respectfully assert that “Related Art” clearly identifies the drawings as related to subject matter other than the invention as set forth in M.P.E.P. § 608.02(g). In addition, there has been no determination that FIGs. 1a-4d are “Prior Art” as defined by any subsection of 35 U.S.C. § 102. Moreover, Applicants have selected the legend “Related Art” to better conform with the specification. [See, for example, the section heading at page 1, line 8.] Accordingly, Applicants respectfully request that the requirement to designate FIGs. 1a-4d as “Prior Art” be withdrawn for at least the above reasons.

Objection to the Specification

The specification is objected to on pages 1-4, 7, and 8 for not referring to FIGs. 1a-4d as “prior art.” Applicant respectfully submits that the requirement to refer to FIGs. 1a-4d as “prior art” is unfounded and groundless. Nowhere in the M.P.E.P., the Code of Federal Regulations (C.F.R.), or the United States Code (U.S.C.) is there a requirement that an Applicant **must** refer to “prior art” upon demand from an Examiner. In fact, M.P.E.P. § 608.01(c)(2) suggests the specification ordinarily comprise a section entitled “Description of the Related Art.” Moreover, there has been no determination that the “other information” (i.e., related art) described at pages

1-4 and 7-8 are prior art as defined by ant subsection of 35 U.S.C. § 102. Hence, Applicant respectfully requests that the objection to the specification be withdrawn.

All Claims Comply with 35 U.S.C. § 112

Claims 9-15, 17, and 18 stand rejected under 35 U.S.C. 112, second paragraph.

Applicant respectfully submits that the claims are definite and that the informalities noted by the Examiner do not rise to the level of indefiniteness. Applicant has amended claims 9-15, 17, and 18 in accordance with the Examiner's comments to correct the informalities and for purposes of improved form unrelated to patentability concerns.

Therefore, Applicant respectfully submits that claims 9-15, 17, and 18 fully comply with the requirements of 35 U.S.C. 112, second paragraph. Accordingly, Applicant respectfully requests that the rejections under 35 U.S.C. 112, second paragraph, be withdrawn.

Conclusion

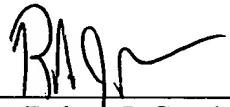
In view of the foregoing amendments and remarks, Applicants respectfully request the reconsideration and the timely allowance of the pending claims. Should the Examiner believe that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning on page 9, line 2 has been amended as follows:

--A metal thin film according to the present invention includes a barrier metal layer 52 formed on a semiconductor substrate 51 including an interleaving insulating film 57 ~~((not shown))~~, and a PVD seed thin film 53, a CVD thin film 54, a PVD reflow thin film 65 sequentially formed on the barrier metal layer 52. The barrier metal layer 52 is of Ti, TiN, or Ti/TiN, wherein Ti is formed by IMP process and TiN is formed by metal-organic chemical vapor deposition (MOCVD) process. Also, the barrier metal layer 52 may be of IMP Ti or IMP Ti/TiN. The PVD seed thin film 53, the CVD thin film 54 and the PVD reflow thin film 65 are of the same material such as Al or Cu.--

The paragraph beginning on page 9, line 16 has been amended as follows:

--Meanwhile, an ARC layer 59 of Ti/TiN may further be formed on the PVD reflow thin film 55.—

The paragraph beginning on page 10, line 1 has been amended as follows:

--As shown in Fig. 6a, a barrier metal layer 62 is formed on a semiconductor substrate 61 in which an interleaving insulating film (oxide film) 67 including a contact hole 68 in a particular portion is formed. To ensure cleanness of the contact hole 68, cleaning process is performed using plasma before the barrier metal layer 62 is formed.—

The paragraph beginning on page 11, line 18 has been amended as follows:

--Additionally, to improve accuracy of a subsequent patterning process, an ARC layer 69 of Ti/TiN may be formed on the PVD reflow thin film 65.--

IN THE CLAIMS:

Claim 9 has been amended as follows:

9. (Amended) The method of claim 6, wherein the PVD seed thin film is formed of Al or Cu with a thickness of 2000Å or less at a ~~[low]~~ temperature of 300°C or less and ~~[high]~~ power of 5kW or greater.

Claim 10 has been amended as follows:

10. (Amended) The method of claim 6, wherein the CVD thin film is formed at a thickness of 1000Å or less, and in case where the CVD thin film is of Al, an organic compound, ~~[such as]~~ **that includes one of** dimethyl aluminum hydride (DMAH), (CH₃)₂AlH, dimethyl ethyl amine alane (DMEAA) and AlH₃N(CH₃)₂(C₂H₅)), and a **first mixture** ~~[blend]~~ material containing the organic metal compound is used as a precursor.

Claim 11 has been amended as follows:

11. (Amended) The method of claim 10, wherein the CVD thin film is formed at a deposition temperature of 150~300°C and a deposition pressure of 1~100Torr using a second mixture ~~{blend}~~ material in which adduct of a small amount is added to DMAH.

Claim 12 has been amended as follows:

12. (Amended) The method of claim 6, wherein the CVD thin film is formed at a thickness of 1000Å or less, and in case where the CVD thin film is of Cu, one of a Lewis-base stablizing Cu(I)beta-diketonate ~~{or}~~ and a second mixture ~~{blend}~~ material containing ~~{it}~~ the Lewis-base stablizing Cu(I)beta-diketonate is used a precursor.

Claim 13 has been amended as follows:

13. Amended) The method of claim 12, wherein the CVD thin film is formed at a deposition temperature of 100~300°C and a deposition pressure of 1~100Torr using a ~~{blend}~~ third mixture material in which tmvs and Hhfac Dihydrate (HDH) are added to Cu(hfac)(tmvs) as a ~~{blend}~~ compound precursor.

Claim 14 has been amended as follows:

14. (Amended) The method of claim 6, wherein, in case where the CVD thin film is formed of Al, the barrier metal layer is formed of Ti, TiN, or ~~[Ti/TiN]~~ **a combination of Ti and TiN**, where Ti is deposited by ionized PVD process and TiN is deposited by ionized PVD or CVD process.

Claim 15 has been amended as follows:

15. Amended) The method of claim 6, wherein, in case where the CVD thin film is formed of Cu, the barrier metal layer is formed of either any of Ta, TaN, ~~[Ta/TaN]~~ **a combination of Ta and TaN**, TiN, and ~~[Ti/TiN]~~ **a combination of Ti and TiN**, or ~~[W_{nx}]~~ **WN_x**, where Ta and Ti are deposited by ionized PVD process while ~~[Ta_n]~~ **TaN**, TiN and ~~[W_{nx}]~~ **WN_x** are deposited by ionized PVD or CVD process.

Claim 17 has been amended as follows:

17. (Amended) The method of claim 6, wherein the PVD reflow thin film is formed by a deposition process performed at a temperature of **at least** 300°C ~~[or greater]~~ and **one of a** power of 5kW ~~[or less or power of 5kW or greater]~~ so as to perform a subsequent annealing process, ~~[or]~~ and ~~[by a deposition process performed using high power]~~ **a sequence of a first power of 5kW or greater** ~~[(5kW or greater)]~~ and ~~[low power (5kW or less) in turn]~~ **a second power of 5kW or less.**

Claim 18 has been amended as follows:

18. (Amended) The method of claim 6, further comprising an ARC layer of ~~[Ti/TiN]~~ **a combination of Ti and TiN** on the PVD reflow thin film.